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CONDITIONS AFFECTING BEET-SUGAR CULTURE IN THE UNITED STATES.

THE phenomenal growth of the beet-sugar industry in the United States and the importance given to it in late congressional considerations, together with the recent action of France in so modifying her laws as to remove 60 per cent. of the customs and internal-revenue tax on sugar, and the relation which this is likely to have upon the readjustment of the world's sugar supply, make a consideration of the desirability of the United States producing her own sugar especially pertinent at this time. This action of France, and the more recent utterance of the Berlin Conference, classifying Russian sugar as "bounty-fed," and fully sustaining Secretary of the Treasury Shaw in his recent contention with the Russian government over the same point, has probably sounded the death-knell of bounty-fed sugar, for we may reasonably expect that an action similar to that of France will be taken by the other states of continental Europe. Should this course be followed in Germany, Russia, and Austria-Hungary, it is inevitable that there will be an entire readjustment of the world's sugar conditions.

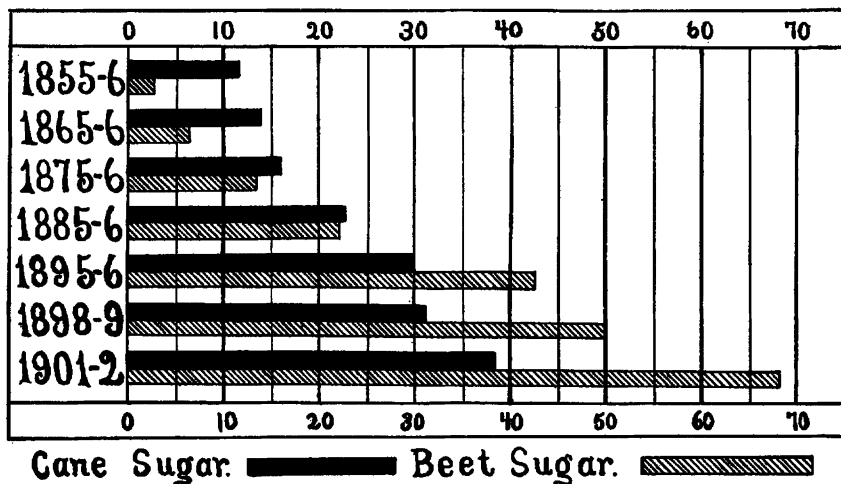
The very natural question is, then: What may be the effect on this promising new industry of the United States?

Our people have become so accustomed to the term "cane sugar" that they do not realize that within the last few years the source of the world's supply has been largely shifted from cane to the beet plant. In 1853 the world's sugar supply was 1,481,000 long tons, of which 304,000 tons is accredited to the beet, or about 21 per cent. In 1902, of the total product of 10,710,000 tons, 6,860,000, or nearly 65 per cent., was derived from beets. During this time it is further interesting to note that there has been an increase in the production of cane sugar of 201 per cent., and an increase of *3,263 per cent. in the production of beet sugar.*

The same facts are more strikingly shown in the following chart, presented before the Ways and Means Committee of the

Fifty-seventh Congress by Dr. H. W. Wiley, in his report on the beet-sugar industry.

The increased importance with which sugar is regarded as a food product cannot be better illustrated than by its increased consumption in the United States. In 1830 the population of the United States was 12,866,020; the domestic sugar production (cane) was 35,000 tons; the cane-sugar importations, 38,612 tons; the total consumption was 73,612 tons of cane sugar and the per



capita consumption, 12.1 pounds. To June 30, 1903, with an officially estimated population of 80,870,000, the United States has imported 2,340,000 tons of cane and beet sugar, which, with a domestic production of 500,000 tons, makes a total of 2,840,000 tons of cane and beet sugar, with a per capita consumption of 75.5 pounds—a sixfold increase in population and a *sixtyfold increase in sugar consumption*.

Notwithstanding this greatly increased proportionate consumption of sugar, we find the per capita consumption in France remaining at the comparatively low figure of 36.9 pounds; Germany, 34 pounds; Russia, 14 pounds; and Austria, 17.6 pounds.

In this connection it must be remembered that the beet-sugar industry of Europe has been fostered and stimulated during these many years by bounties, under which an export trade has been

built up, especially to Great Britain and the United States, which is entirely out of proportion to her natural home consumption. The result of this bounty-feeding of the industry in Germany, Russia, and France has been to make the European pay twice as much for his sugar as the American pays for the same sugar when it reaches this country. Germany, with a population exceeding that of Great Britain by 15,000,000, and producing nearly one-third of the world's supply, has a per capita consumption of but 34 pounds, while Great Britain consumes about 90 pounds per capita, and the United States 75.5 pounds.

The most efficient reason for this greatly disproportionate consumption in the United States and Great Britain, on the one hand, and the countries of continental Europe, on the other, is the system of taxation which has obtained in those countries, and which has raised the price of sugar for domestic consumption enormously above the cost of production; while these same countries offer their sugar to foreign countries at a price very close to the cost of production, and sometimes even under that cost.

It is reasonably certain that, with the modification of these foreign laws, which have so artificially fostered this exportation of sugar, we shall see a rapid increase in the per capita consumption in these countries, and a consequent decreased supply for our own use, unless there are other fields developed from which we may draw. During the past twenty years there has been an average increased consumption of about 7 per cent. owing to the conditions existing in Europe, as indicated above, and we certainly cannot expect any increase in the percentage of sugar which we now obtain from that source. On the contrary, it is far more likely that, with the increased consumption and a possible curtailment of the industry in Europe, our supply from that quarter may be materially lessened.

These are some of the conditions with which we must reckon when we are seeking to meet the increasing consumption in this country. We must look to Cuba, Porto Rico, Hawaii, and the Philippines, and the extension of our own domestic industry, to satisfy our ever increasing desire for sugar. What, then, may we expect from these sources? As to the Cuban supply, we can

hardly look for more than 1,000,000 tons which are likely to seek a market in the United States, if we make full allowance for ante-bellum conditions. According to the official report of the United States Department of Agriculture, we cannot expect any increase in sugar production in the Hawaiian Islands, thus setting 300,000 tons as a full estimate of the *reliable* supply from that quarter. Porto Rico can safely be relied upon for 100,000 tons, which has been the production under our administration of the island. Allowing 200,000 tons as the possible increase for the Philippines, which gave us, in 1902, 80,000 tons, we have 680,000 tons in sight for our supply.

Our consumption for the year closing June 30, 1903, was 2,725,746 tons of 2,240 pounds each, and our domestic supply 300,000 tons of cane and 195,000 tons of beet, and about 5,000 tons of maple sugar. This leaves 545,000 tons to be supplied, on the basis of present consumption, either from foreign ports or by increasing our production. Why should we not produce this additional supply of sugar in our own country? To produce at home a ton of granulated sugar from the raw material, there accrues to American industry, in the production of the beets, the labor in the factory, and the cost of material used in the manufacture, an average of \$75; while importing a ton of raw sugar and refining it in the United States returns to us but \$6.70. Should there, then, be any question about encouraging the home industry?

We have the soil, the climate, the farm system, the farmers, the farm machinery, the transportation facilities, the fuel, the water, the limestone, and the market which make the industry thoroughly practicable. The sugar beet has a place in our system of farm management, which is gradually changing to that best adapted to the sugar beet. But it still remains for us to adapt sugar-beet culture to our conditions, rather than follow entirely the European plan where labor is cheap and land is dear. It remains for us to devise better machinery and ways of utilizing it to better advantage than at present in the production of this exacting crop. In both of these directions a substantial start has been made, and machinery of American make is already taking

the leading position, both on account of economy and ease of operation. We have not yet, however, devised the best methods of handling the soil to meet the requirements of this crop, especially in our more arid regions.

The growth of the industry in the United States has been second only to its growth in the sugar world. As an American industry it is not more than thirty years old, for it was in 1869 that the first plant successfully to manufacture beet sugar was erected in California. This plant manufactured in its first campaign 500,000 pounds of sugar. In 1890 there were but 3 factories in operation. In 1900 the number had increased to 30 (an increase of 900 per cent. in ten years), while in 1903 the number in operation was 56 (an increase of 86 per cent. in three years), while 4 more were operating in Canada, and several new ones were scheduled for the campaign of 1904. These mills are scattered all the way from New York on the east to California on the west. Michigan leads with 22 factories, followed by Colorado with 9; California, 8; Utah, 7; Nebraska, 3; New York, 2; and Minnesota, Ohio, Wisconsin, Oregon, Washington, and Idaho, each with 1; not to mention those across the Canadian border. We should not delude ourselves into thinking that these are the only states capable of successful beet-sugar production, nor that the areas, in the states named, suitable for sugar production have all been utilized, for there still remain very large areas in the central and western states which are as well adapted to the industry as those in which it has been introduced. We must concede, then, that the industry is quite beyond the experimental stage, and has become a reality in this country and a factor worthy of the attention of the people.

In Professor Henry C. Taylor's recent interesting article¹ on the subject of American sugar-beet culture, he attempts to show that the sugar beet cannot compete with corn in what is known as the corn belt, and concludes that —

Any attempt to establish the beet-sugar industry where it must compete with Indian corn is likely to prove a failure, and that, for this reason, our efforts

¹ Some Conditions Affecting Sugar Beet Culture in the United States, *Annals*, Vol. XXII, p. 179.

to establish this industry should be restricted to that part of the beet region of the United States which lies outside of the corn belt.

The fundamental basis of his argument is the idea that the sugar beet is a competing crop with corn in the system of rotation which is most economical for the farmer in the corn belt, and that therefore, if it be introduced at all, it must be in place of the more profitable (?) crop of corn, rather than as a rotation crop, since the beet requires constant care during the period in which the corn requires it. If the writer's position, that the sugar-beet industry is not as profitable to the farmer as the corn production, were well founded, then the argument is sound; but unfortunately he has failed to present any figures to bear out the contention.

Before proceeding to a discussion of the relative profitableness of the two crops, it may be well to notice Professor Taylor's statement that in France, Germany, Austria-Hungary, and Russia there still remain vast areas which could be devoted to beet culture, if the price of sugar were slightly higher, and to observe that the conditions which have already been described as now existing there are more likely to result, so far as this country is concerned, in a diminution rather than an increase of supply. Moreover, whatever increase in acreage might arise would certainly be more than equaled by the increased per capita consumption which is bound to occur from the removal of the factors which have held up the price of sugar in those countries; and a lowering in the price of European sugar is more likely to follow than the opposite condition.

In this country, too, we are more likely to experience a gradual reduction in the price of sugar than any material increase, if we may judge from the history of the industry. From 1888 to 1898 there was a decrease in the price of sugar of about 40 per cent., but the price paid for beets remains practically the same. This shows that the decrease has been brought about through the better adaptation of machinery and the improvements in the methods of factory manipulation, which have lessened the cost of sugar to the consumer, but have not materially reduced the price paid to the farmer. It is fair to assume that we may see a still further reduction in the same direction, although probably not to so great an extent.

That there will be an expansion of the cane industry in foreign countries beyond the official figures given above may be seriously doubted — at least it is beyond the realm of the probable. In the United States, however, there is certainly room for a slight extension, and with more scientific study devoted to cane cultivation and manufacture, Georgia, Florida, Alabama, and Mississippi should be able to join hands with the North and West in producing our entire sugar supply without the importation of a single pound from Cuba.

It is unfortunate that we have but few figures covering any sufficient length of time where corn and beets have been side by side, but it will be admitted, no doubt, that both climate and soil of most of the corn belt are well adapted to the production of the sugar beet. This has been conclusively shown by the investigations of the experiment stations in Illinois, Wisconsin, Iowa, and Ohio. In Bulletin 49 of the Illinois station we find the following conclusions:

That Illinois can produce sugar beets of excellent quality for manufacturing purposes; that this production is not limited to particular sections of the state; that under present conditions beets can be produced at a cost which will insure comparatively large profits for both grower and manufacturer. Essentially similar conclusions have been reached from work in the other states in the corn belt. The matter rests, then, simply upon the relative value of the corn and beet crops to the farmer.

Admitting that it is a competing crop with corn, so far as rotation is concerned, let us compare the one crop with the other, as to the profits to the farmer. In the first place, let us turn to the state where the industry has been in operation for the longest time, California, and, to make the results more correctly comparable, let us select the locality which most nearly represents that of the corn section by having essentially a humid climate, namely, Alvarado, the mother location of the industry, where sugar has been made since 1870. That the conditions are favorable to the beet industry is evidenced by its long-continued success in that locality. Here we find that on an average, from over 3,000 acres of beets annually for the past thirteen years, there has been a yield of 9.75 tons per acre, for which there has been paid an

average price of \$4.60 per ton, giving a return of \$46.54 per acre, including good, bad, and indifferent years. Allowing \$30 per acre for the cost of growing—which may be considered a fair average—we still have left as net profit \$16.54. Turning to Watsonville, where again we have the humid climate, we find about the same conditions existing, for in that region, including good, bad, and indifferent seasons for ten years preceding 1898, there has been an average yield of 11 tons per acre on 60,000 acres of land, which, at an average price of \$4.50 per ton, have given a return per acre of \$49.50. In both of the localities named individual crops frequently run as high as 20 to 25 tons per acre, producing a gross income of over \$100 per acre. Allowing, again, \$30 per acre for expenses, we have as a net income, on an average of ten years, \$19.50, which even runs as high as \$70 in individual cases.

Turning our attention to the results obtained with corn, as set forth from the official publications of the Department of Agriculture, and *The Corn Book* recently issued by the Orange Judd Publishing Co., we find that Illinois, which must be considered as the leading corn state, in 1902—a fair year for this product both as to climatic conditions and price—grew 9,650,000 acres, and produced an average of 38 bushels per acre, which brought an average price of 50 cents per bushel, or a total income per acre of \$19, from which must be deducted the cost of production, which, after much careful investigation by the *Orange Judd Farmer*, is stated as \$5.06 per acre, or \$13.94 net profit. If we take for our basis the average production in the corn-growing states in 1902, we find it to have been 27.1 bushels, which, at the same price and cost of growing, gives but \$8.44 for the net profit per acre.

Of course, this comparison is between beets grown under California conditions and corn grown under Illinois conditions, but what we are seeking just now is to get the two crops grown under well-known suitable conditions, as demonstrated by a thorough test of time, and to show what the sugar beet may be expected to do under as favorable conditions as corn for “a long-time average.”

Practically the only state where we can get the two crops together is Michigan, which in 1901 produced from 1,577,000 acres an average of 30 busnells of corn which at the ruling price would return a net profit of \$9.94. The sugar-beet crop in the same state and in the same year was 9 tons per acre, at the average price of \$5.20 per ton, or \$46.80 gross. Deducting again \$30 for production, we have \$16.80 net profit per acre; \$6.86 per acre in favor of beets, which excess of beets over corn is nearly as much as the entire net profit per acre from all farm crops in the United States. It is further significant to note that in the state of Michigan \$3,107,520 is paid to the farmers for beets produced on 66,400 acres of land, whereas the corn crop from 1,577,000 acres brings but \$23,655,000. Planted to beets, one-twenty-fourth as much land as was planted to corn produced one-eighth of the value of the corn crop, which is equivalent to saying that the beets had three times the money-producing power of the corn on the same acreage, and certainly "increases the farmer's power to command the desired consideration upon the market," which is one of the conditions demanded by Professor Taylor for the beet crop.

This of itself should be a satisfying answer to Professor Taylor's contention that sugar beets, as measured against corn, do not fulfil this

most fundamental principle of modern agriculture . . . that each farm should be operated in such a manner as will make it yield the largest long-time average net return, and only those crops which will add to the total net return should be included in the field system.

It is, of course, possible to find much higher yields of corn than those given as the average; as, for illustration, in a recent contest 191 bushels of crib-cured corn was produced on an acre of ground, yielding a net profit of over \$90; and the writer doubts not that even this has been surpassed; but against such exceptional yields of corn we must place such equally exceptional yields of beets as 30 tons per acre, with net profits approximating \$100 per acre. These, however, are not just measures, and should never be considered in measuring one crop against another.

The writer of the article under discussion very naturally attempts to connect corn-growing and pork production, but

ignores entirely one of the potent factors which make for profit in the beet-sugar industry; namely, the use of the pulp as a cattle food. It is only when our farmers appreciate the high value of this material as a succulent cattle food that the highest possible returns will be realized from beet culture. While we might well offset the pork and beef production with corn by beef, mutton, and dairy products from beet pulp, yet it is a subject worthy of more than passing attention. Unfortunately our farmers are inexperienced in the use of pulp, and as a result our factories, in many cases, have hard work disposing of their supply; but the time is not far distant when the pulp will win its way into favor and become as staple an article of commerce in this country as in Europe. Several of our experiment stations have already demonstrated the value of pulp. In Colorado it has been proved that pulp costing \$1.50 per ton can be fed at a profit. In Michigan the addition of pulp to a ration produced \$2.03 worth of beef per ton of pulp fed, or at \$1.50 per ton gave a profit of $33\frac{1}{3}$ per cent. In New York it was shown that two tons of pulp gave as satisfactory results as one ton of corn silage. Thus, then, the farmer in the corn belt who is wise enough to devote a portion of his energy to beet production may find a valuable food for cattle, for sheep, or for the production of dairy products.

It would certainly appear, then, from the evidence presented (and much more might be added along the same practical line) that the sugar beet is certainly a very worthy rival of corn, and from the fact that it gives employment to so many more people than the comparatively low grade of farming required to produce corn, it is certainly worthy of the attention of the people in the corn belt.

Further, it is not at all certain that the demand for corn will keep pace with that of sugar. Few people are aware of the enormous consumption of sugar. The use of no other food has had a more astonishing growth. In this connection it is of interest to note how its growth has run along a parallel line with that of a few other staple articles of food. In 1873 the per capita consumption of wheat in the United States was 4.81 bushels; corn (for man and beast), 22.86; sugar, 39.8 pounds. For the year

ending June 30, 1902, the per capita consumption of wheat (including flour) was placed at 6.5 bushels; corn (for man and beast), 18.92; sugar, 72.8 pounds. Thus within the last twenty-nine years the per capita consumption of wheat has increased 35 per cent., the per capita consumption of *corn has decreased 17 per cent.*, while that of sugar has increased 83 per cent.

In the article referred to, Professor Taylor truly says of the two crops that "both are cultivated while growing, so either prepares the soil for small grains and makes fallowing unnecessary." He fails to notice, however, another very important consideration for the farmer who produces a cereal crop in rotation, as is the practice in the corn belt, namely, the fact that the more intense and deeper cultivation demanded by the sugar beet has a very marked influence in increasing the yield of grain, as demonstrated not only in Europe, but also in this country. This cannot be claimed with any degree of assurance for the farming required by the shallow-rooting corn crop. The effect of the introduction of beet culture upon several crops is shown in one of the consular reports, as follows:

The ten-year average crop from a 625-acre farm growing cereals was 5,736 bushels of grain before beet culture was introduced. After beet culture was introduced, 125 acres were planted each year with sugar beets, the average crop of grain from the remaining 500 acres was, 5,730 bushels yearly, being a clear gain of the product from 125 acres. Thirty-five other farms showed the following increase after the introduction of beet culture, in a ten-year average:

SHOWING INCREASE IN VARIOUS CROPS DUE TO INTRODUCTION
OF BEET CULTURE.

	AVERAGE POUNDS PER ACRE		
	Before	After	Increase
Wheat	1,848	2,128	280
Rye	1,456	1,672	116
Barley	1,672	2,094	322
Oats	1,355	1,918	563
Peas	985	1,834	949
Potatoes	11,716	13,569	1,853

It is said that there has been an increase of about 21 per cent. in all crops in Germany and Austria-Hungary in consequence of sugar-beet culture.

This clearly shows that the farmer who rotates beets with his other crops not only does not decrease the long-time producing power of his land, but, on the contrary, increases it.

The successful growing of sugar beets elevates farming from a primitive cereal-growing occupation to a more scientific plane requiring a better agricultural education and judgment, and in this respect must be ranked beside horticulture and dairying.

Aside from the possible close relation of this industry to dairying, as in the case of corn, there would seem to be four very valid reasons why farmers should give more attention to the beet crop:

1. It is a cash crop, with the price practically fixed in advance.
2. It is one of the surest crops the farmer can grow, if given the requisite attention.
3. There is a greater net profit in it than in most other crops, if it be grown under the proper conditions.
4. It materially increases the production of other crops, especially the cereals, because of the deeper cultivation of the soil demanded by the beet crop.

G. W. SHAW.

UNIVERSITY OF CALIFORNIA.